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SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

Smokes for soldiers and the rest of us...medicines and insecticides...startling new developments in tobacco growing under erosion control, in an interesting article by Phoebe O'Neall Faris. Also within, are pointed papers by H. H. Bennett and J. E. Church.

UNITED STATES DEPARTMENT OF AGRICULTURE – WASHINGTON

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WELLINGTON BRINK
EDITOR

SOIL CONSERVATION is issued monthly by SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may also be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps will not be accepted in payment.

SOIL CONSERVATION

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It has been said that wit was born into the Old World with the first tobacco pipe. Certain it is that there is nothing funnier in post-Sir Walter Raleigh literature than the poetic dreams and prosy fantasies of Old World antiquarians who tried vainly to prove that the "weed" was known to ancients many centuries before "that first week of November 1492," when "Europeans first noted the American Indian custom of tobacco-smoking." One Turkish traveler even claimed to have found a tobacco-pipe imbedded in the wall of an edifice constructed before the birth of Mahomet; and, to make assurance doubly sure he declared that it still retained the smell of tobacco-smoke. An Irishman found a short pipe sticking in the mouth of the skull of an ancient Milesian "at Bannockstown in Kildare"—and at once there appeared a learned paper parading the relic as proof of the use of tobacco in Ireland ages before America thrust its giant head above the horizon far in the western ocean. Were they envious of the new continent and its "philosophick weed"? Or, was it but a gangling phase of the new wit, born of smoke-rings from Old World pipes packed with tobacco grown in Maryland and Virginia?

There is an herbe which is grown apart by itselfe

By Phoebe O'Neall Faris

Only the Indians of the Americas can be called the ancient users of tobacco. The Mound Builders smoked it, in porphyry pipes of ingenious fabrication. The aborigines of Yucatan considered tobacco sacred. The Brazilian Indians were the "fathers of snuff." The Red Men of the West Indies "disgusted" Columbus by everlastingly snorting through their forked pipes.

Without doubt, tobacco is truly an American weed, and in view of the tremendous amount of literature on how the Indians used the plant it is amazing that there is so scant an indication as to how they grew it. Some three and a half centuries ago a Governor of Virginia wrote thus in his Briefe and True Report: "There is an herbe which is sowed apart by itselfe, and is called by the inhabitants *uppówoc*. In the West Indies it hath divers names . . . the Spaniards generally call it *Tobacco*." Apparently the North American Indians did have special cultural methods for their *uppówoc* which in their native friendliness they passed on to the colonists.

It may be that the Indians knew that much of the soil of what for long now has been Southern Maryland was adapted by nature to the growing of tobacco. But, more than likely, then, even as now, the Red Men did not tell all they knew. Slowly retreating westward, they left it to the English settlers to do the hard work of hacking away the forest to expose the mellow, friable soils, so easy to till, and

1:15 p. m.

1:50 p. m.

2:10 p. m.

2:45 p. m.

Water under control. This series of photographs was taken during an hour and a half of rainfall at the SCS hill-culture tobacco tract, Beltsville, Md. The young plants are in ridged rows on a 1-percent grade.

start, in the middle of the 1600's, a new husbandry dedicated to a human foible, yet destined to become an economic giant reaching

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This Maryland tobacco farm was planted up-and-down hill, the old way, the wrong way. The usual heavy summer rains came as the crop approached maturity—a ruined field, a poor crop, wasted labor.

into every chink and cranny of the world—and destined likewise to play a slow and sure havoc with the soils of a certain coastal area called in great days the Tidewater.

There isn't any doubt, in this year of world war, that the Indians started something when they taught white men to use their weed. Today, in spite of its paradoxical history, tobacco, although not a food crop, is a "must" crop, all bound up with our intricate economic system and our war effort—the soldier, just out of battle, asks for a "smoke"—and providing livelihood for millions of our people in various areas throughout our country. Southern Maryland is one of these areas.

Some recent writers and others not so recent have maintained that the day of tobacco is past and gone in the Maryland Tidewater—that the soils are "tobaccoed out." On the contrary, it looks today as though those writers, recent and not so recent, reckoned what they knew not of; they reckoned without the new pattern of farming, no matter what the crop, and a certain group of men who believe in experimenting to the point of certitude and then demonstrating to farmers conclusively that there is a right way to farm. These men know that the most seriously eroded and depleted soils in Maryland are those soils that have been used longest and hardest for tobacco. They are nevertheless convinced that the more than half-a-million acres of "natural" cigarette tobacco soils of Southern Maryland can be improved to the point of "excellent" tobacco soils, and kept that way even while tobacco production is maintained to meet demand.

They look at it this way: There is very little demand for poorer tobacco grades and therefore only land suitable for production of high quality tobacco should be used for growing tobacco. Such land must have all possible soil conservation and at the same time the "temperament" of the tobacco plant itself must be so thoroughly understood that correct soil conserving and soil improving culture will be "normal" culture. They are determining, by experiment, the ways and means, the methods and the fine points, for maintaining high-grade cigarette tobacco production on the Sassafras-Collington soils of the Southern Maryland area, without further soil erosion and with good yields. Their real heart-and-soul objective, one suspects, is permanent security for the tobacco farm people who for generations now have been sending much expensive fertilizer downstream, along with their priceless topsoil, to clog the little river ports with shifting shoals and reefs. After all, Southern Maryland's principal cash crop is still tobacco.

People working together toward the same end—that is cooperation; and that is what is going on out in Maryland for the benefit of tobacco growers. As a matter of fact, these experimenters are cooperating so closely and are so interested each in the other's plats, fields, plans, and findings that it isn't easy to put your finger on one as a Government man, another as a State man, a county man, a district man, and so on. They are, however, representative of several great institutions:

Dr. Garner, in charge of the Division of Tobacco Investigations, Bureau of Plant Industry, keeps a watchful eye over all, for coordination of ideas and results. Dr. J. E. McMurtrey is senior physiologist of the same division, and is famous for his studies and writings on deficiency symptoms of tobacco—he can look at a speck on a leaf and tell you what "essential" that plant lacks. W. B. Posey, Specialist in Tobacco for the University of Maryland, is primary adviser on how to grow tobacco in the field and what to do with it after you have grown it—he is well known to Maryland farmers, was born in Southern Maryland and there isn't a weed or a hornet in the Tidewater that can escape him. C. S. Britt, associate soil conservationist of Soil Conservation Service's Hillculture Division is all wrapped up in devising best methods of growing good tobacco on Maryland's slopes without further loss of Maryland's soils. He does not scorn picking off big green worms that may have invaded his plats—he snips off their heads with the greatest of ease. D. E. Brown is superintendent of the tobacco ex-

perimental center near Marlboro and to him tobacco is still the "gold of the Province." There are others whom I did not see on a certain sparkling summer day—E. M. Davis, our Service's State conservationist for Maryland; and M. B. Fussell, district conservationist located at the Marlboro office. These two no doubt were all over several counties that day—more than 5 inches of heavy rain had pounded the area the preceding 48 hours and soil conservationists like to get out on the ground at such times.

Some of the things these men have learned about the Indian "weed" certainly would have amazed the Indians, not to mention the poor man of England of the 1600's who had his first puff of its aroma through a walnut shell and a straw. Other American weeds are very much in the picture these days out in Maryland's cigarette tobacco area, and this is most encouraging news to soil conservationists because weed cover controls erosion just as does any other plant cover. When the weeds are good for both soil and crop, with a substantial advantage to the farmer's income, then you have something.

For upward of 30 years plant scientists have been making intensive studies at the Maryland tobacco experiment station, at Marlboro, to determine practical methods that can be used by Maryland farmers to produce good yields of high quality tobacco on their Sassafras-Collington soils. Fertilizers and manures alone did not do the trick, and certainly did nothing in the way of holding the soils in place. Everybody knew that newly cleared forested areas produced the finest tobacco yields—but that was impractical, to say the least, because all the forested areas had been cleared. Nor can many farmers anywhere afford to let their tobacco lands lie idle for long years while even a scrub forest takes its leisurely time about growing; a farmer can go on the rocks this way just as certainly as he can if he goes on setting out tobacco plants, year after year, in soil that is completely exhausted of the plant nutrients essential to his crop.

Tobacco farming in Southern Maryland must have looked rather hopeless at the beginning of the century, but not so today. Twenty years of experiments ought to mean something, and it is just that long since W. M. Lunn and Mr. Brown of the Bureau of Plant Industhy started tests with tobacco grown after natural weed fallow at the tobacco field station at Upper Marlboro where the land is level and the soil Collington fine sandy loam. Although Mr. Lunn died in 1939 the experiments still go on, and it is now apparent that unparalleled success can be obtained by allowing the land to revert to a natural weed cover following a crop of tobacco and then planting more tobacco. "Resting" the land through one growing season, under weed cover, served over a period of 13 years to increase the value of the succeeding tobacco crop $160 per acre above tobacco grown after bare fallow. Two or more seasons under weeds gave still greater returns—$34 per acre more. Thus we have a rotation system definitely planned to include weeds.

What is more, it is an established fact now that the common ragweed, found anywhere from the Atlantic to the Mississippi River, is a primary benefactor of the tobacco crop, though many other annual weeds including the legumes, wild pea, partridge pea, and rabbitfoot clover play a part. Here, then, is the latest paradox regarding the Indian's paradoxical weed, tobacco: Ragweed grows good tobacco; hay fever victims get hay fever from ragweed; most hay fever victims use tobacco . . .

With the patience characteristic of the true scientist, these Maryland experimenters grew a great variety of local weeds in pure cultures, plowed them under and grew tobacco, checked and double checked, using dollars and cents values as criteria. They have learned to know the weeds as "best" weeds, "good" weeds, and "bad" weeds—for tobacco. The ragweeds and horseweeds are bests, while the lambsquarters and lespedezas are bads. The ragweed comes in first, by order of Mother Nature apparently; the biennial horseweed invades by wind-blown seeds the second season, by a like command; and if the land is rested for three or more years weeds of the perennial growth type such as broomsedge, goldenrod and aster become increasingly prominent in the weed population.

The tobacco farmer, however, does not need to be concerned with weeds in pure cultures, except during the tobacco year of the rotation when he will want a good, clean, and "pure" stand of the great American Indian weed, tobacco. He will need to have only weeds in abundance, for plowing under in the spring, to prepare the land for a bumper crop of tobacco. Incidentally, plowing under in the spring seems to be $84 better than plowing under in the fall. And, again, this is good news for soil conservationists. Keep the soil covered—some say it is getting to be an obsession with us—but you never know when the sky is going to open to let out a flash flood.

What about land that still is cropped to tobacco year after year? The tobacco specialist at the University of Maryland,

W. B. Posey, has developed with more than a little success a winter cover of wheat and hairy vetch for use on such land. Farmers who have limited acreages of Collington or Sassafras soils have used this practice on relatively flat land for as long as ten years and are still producing good tobacco crops. The land is seeded to the wheat-vetch mixture as soon as the tobacco is harvested; the seeds germinate quickly and with favorable weather a good protective ground cover develops before winter freezes begin.

Under this system the ground is bare of any cover except tobacco—which definitely is not a soil-erosion control crop—for about one-half of the total rotation period of 12 months. Under the 2-year tobacco-weed rotation the soil is bare of any cover except tobacco for approximately 12 out of 24 months. The proportion is the same. Then why not combine the seeding of vetch and wheat with the weed cover period and reduce by about one-half the unprotected period in the tobacco-weed rotation? They tried this out at the Marlboro station and proved that it can be done without interfering with the efficiency of the weed cover.

That the tobacco growth period still is the weak link in the system is best realized by the soil conservationist. He knows how much good soil goes down the river never to return, especially if the unprotected soil is on sloping land. In Maryland, "natural" tobacco soil does occur frequently on hillsides. Thus when the Soil Conservation Service hill-culture work started at the Beltsville Research Center in Maryland the problem was how to grow tobacco on sloping land and at the same time keep the soil in place and conserve the soil fertility and the water. Cooperating with the Maryland Experiment Station and the tobacco experimental farm at Marlboro, Soil Conservation Service men planted two hilly fields to tobacco—one with up-and-down hill rows, the other with strongly ridged rows laid out across the slope. Rains came. During a single thunder storm yielding a 3-inch rainfall, upward of 70 tons per acre of topsoil was dislodged and washed away from the field with up-and-down hill rows. The contoured field with ridged rows lost practically no soil. This technique for controlling erosion has not only held the soil in place but has yielded an average return in tobacco value that is $50 to $75 greater than the like areas that had no such protective treatments.

The row structure is interesting. A middlebuster is used to throw up ridges approximately 10 inches high to receive the young tobacco plants. This provides aeration and prevents wilting from water logging. The trenches between ridges perform two useful purposes—they catch rainfall and allow it to sink slowly into the ground for the benefit of the crop, or in case of heavy rains they carry excess water around the slope to the grassed waterways. Of course the contour row gradient is extremely important: With ridged row structure, exact contour and 1-percent row grade has been superior to steeper row grades. Obviously, the strongly ridged row is to be used only with cultivation across the slope.

There appears to be no practical reason why the contour ridged row system of cultivation would be any more expensive to carry out on the tobacco farm than the old flat up-and-down hill method, even though some of the land area must be used for grassed drainage channels. The extra return from the crop is money in the pocket, and at the same time the soil is kept on the field so that its fertility can be built up for even greater future returns. Tests are now being made at the Beltsville station to determine the value of straw mulching in the tobacco culture system.

An old writer, famed for his subtle wit, set down for all the world to see these words: "Eating tobacco is essentially an American custom, and was no doubt derived from the example of the worm that lives upon the growing plant." Well, we do not eat it; but we do raise it on millions of acres of our land. Let us learn then to do the job the right way—for the sake of our soils.

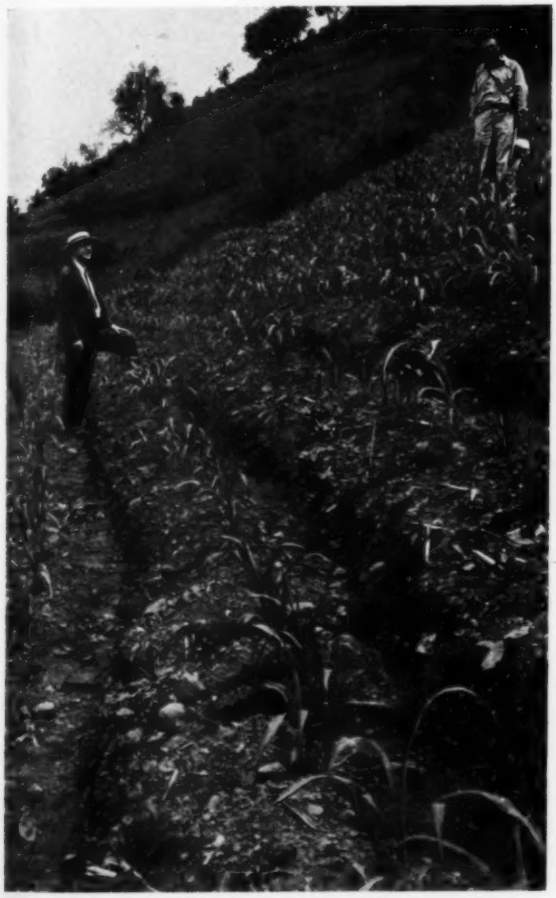
Left.—Natural weed fallow. Right.—Tobacco following weed fallow. (Marlboro, Md., Tobacco Experiment Station.)

Some Glimpses of Rural Mexico

By H. H. Bennett, Chief, Soil Conservation Service

To Tenancingo

The work of Section II (Agrology), Second Inter-American Conference on Agriculture[1] *completed, several of us joined a number of technicians from the Mexican Department of Agriculture on a trip to the Tenancingo country, some 50 miles southwest of Mexico City. It was a typical July morning on the high-plateau, delightfully springlike.*



Corn on terraced slope above Tenancingo, Mexico; a furrow break in the foreground. H. H. Bennett faces up the hill toward Ing. Lorenzo R. Patiño.

One of the most interesting parts of the trip was the reforestation done by the Government of Mexico just outside the city, on the paved highway to Toluca. Here, over a large area, the plateau which rises gradually toward the west has been deeply incised by a number of streams and streamlets heading in the locality and flowing easterly to the canals that lead the drainage of the city and its environs off through the lower country northeast of the city. These headwater streams flow through deep trough with steep slopes that have suffered severely from sheet and gully erosion.

The plantings—mostly eucalyptus, ash, casurina, and cedar—were doing splendidly, especially considering the general unfavorableness of the land. I had seen these plantings two years before, when they were new, and was much surprised at the excellent growth already made. The trees are now beginning to lay down some forest litter—mostly leaves, but apparently enough to restrain erosion considerably.

We made several stops beyond the forestry project to examine interesting aspects of cornfields. Nearly everywhere about Mexico City we found corn to be of the same variety—a high-altitude type with hairy stems showing a bluish cast.

An interesting method of corn culture on slopes was seen in a number of fields along the Toluca Road, as well as in other localities. The furrows between the rows follow the contours fairly close and are shaped square by hand work to the approximate dimensions of 12 inches deep by 12 inches wide at the bottom. A farmer of the neighborhood explained that this kind of open furrow, in carrying off excess water, prevented the crop from turning yellow during the rainy season. It occurred to us that the furrow was quite capable of trapping a considerable amount of eroding topsoil and also of directing some of the "excess" rainfall into the reservoir of the soil for subsequent requirements.

In some fields haba beans (horse beans) are grown between the corn rows. This came about as near to being a rotation practice, with legume included, as was observed on the trip.

Finally, at still higher elevation, we passed through a belt of evergreen coniferous forest. Someone said this section of beautiful green forest and lush grass was known as the "Desert of the Lions." When the question was raised as to what kind of lions, we were told there was not even one lion of any kind in all the locality.

"In that case, why mention lions?"

"Well, you see, it may have been that whoever named the place wished to emphasize the complete

[1] See the article on this conference by Edward H. Graham, in the October 1942 issue of *Soil Conservation*.

Pine forest near Rio Frio, east of Mexico City.

absence of lions by use of the word desert, which in Spanish sometimes means deserted. Anyway, the lions have departed, if they were ever here."

With all the dangerous lions thus readily disposed of—not excepting even so much as a southwestern mountain lion—we continued safely in the direction of Toluca still more or less convinced that those highlands were too verdant and refreshing to be referred to in any sense as desert or deserted.

Leaving Hidalgo National Park near the foot of the mountains, we crossed a brook of sparkling clear water that came dashing gaily out of high forest. This was where a new bridge and a stretch of new road were being built. It was also near the fish hatchery, along the edge of the important corn-producing Lerma Valley, or Toluca Valley.

I somehow can't forget the name of the truck that led us in the procession of trucks, auto-busses, plain autos, and vehicles of lesser order that marched slowly over this section of the highway. The name was: "I don't stop long young lady." And recalling the name reminds me that in Mexico, as in Cuba and various other countries, practically everything that moves on one or more wheels has a name—often a beautiful name. And frequently, too, the animals all have their individual cognomens. In Cuba, for example, carts are often drawn by unexcitable oxen exquisitely named, and lustily called to by their drivers "Violet," "Butterfly," "Humming Bird," "Yellow Flower."

Well, why not? There really may be more in a name than Shakespeare was willing to concede. The Cuban oxen know their names perfectly, and they usually respond to any reasonable request or expletive the driver directs to them personally. And we name our pullman cars in the United States just as beautifully, and then promptly denote them by numbers.

At Toluca we had a second breakfast: a light one, you might call it for politeness, but good. The piece de resistance was scrambled eggs with sausage mixed in—a special Toluca brand of sausage that you should try next time you pass that way. It's really good. The coffee, too, I can recommend most heartily. Mexicans really know how to make it.

As we came out of the restaurant, four Indian women trotted by with huge cargoes of plants or herbs perfectly balanced on their heads. These stout women from the rural districts are said to travel long distances carrying heavy loads, always at a shuffling sort of gait—and with happy faces. They sometimes cover as much as 35 or 40 miles a day, with great loads on their heads and babies in their arms. The men, too, often carry unbelievable loads of lumber, pottery, baskets, chickens, and other articles of trade. There is doubtless malnutrition in some families, but seemingly not much of it where these stalwarts come from.

Going south from Toluca, we passed many other carriers of cargoes. Among them were fleets of donkeys, some laden with pulque, others with lumber, and still others with a variety of sacks, boxes, kegs, and great bundles containing things we knew not of.

Pulque is transported in goatskins. As time passes, gas often accumulates in these flexible containers in such manner as to straighten out the leg

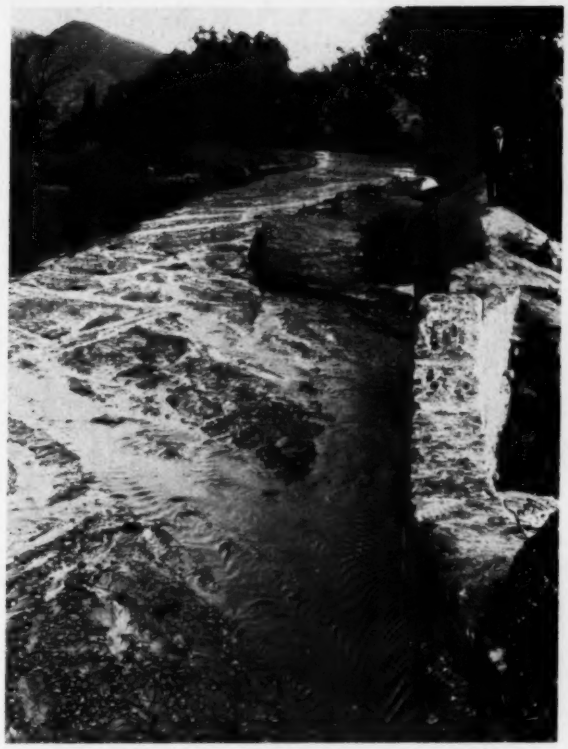
No bridge. No ferry. But the highway finds a unique way to get past this stream that has taken to the air.

parts. The motion of the donkeys sets up a sort of flopping about of the liquid inside the skins, which, in turn, starts a jerking or waving motion of goat legs protruding outwardly that makes you wonder at first sight if it really is necessary to imbide pulque in order to get the full effects.

And that was not the most astonishing thing about this goatskin method of transporting liquid refreshments. When a boy in charge of a battery of some 20 pulque-laden donkeys stopped near where we were looking at an extra good type of Lerma Valley soil, and let go of the pressure in the goat legs by untying a string along about the hoof joint, the gas thus released set up weird sounds of whistling and swishing like escaping steam. I think I must have pretty well forgotten about the soil we had been examining, as its profile characteristics are only dimly retained.

We entered Santiaguito not by crossing the Santiaguito River that flows by the city on the north side, but by going right on under it—I mean under the river. It seemed more like going through some sort of burrow than anything else—not at all the same simple thing as passing through a tunnel. What we drove through was a hole that had been projected beneath the elevated river bed so the road could get on its way into the city, there being no bridge or ferry for its convenience.

Santiaguito River obviously has been quite an active stream during its career on the great Mexican Plateau. During recent centuries it has gone diligently about the business of transporting huge quantities of soil out of the overgrazed mountains to the west, piling it up in the channelway and along the banks until the actual flow is today about 15 feet above the adjacent broad, flat plain of corn fields.



Looking upstream on a flying river south of Toluca.

By this process of self-elevation, the stream has moved up into the air to such extent we could not resist calling it a "flying river." We saw similar streams in the Toluca Valley and the next day in the State of Tlaxcala.

South of Santiaguito we crossed the mountains by a delightfully cool pass, first through pine-oak forest and then through pine alone. On the way down the south slope into the valley of Tenancingo we crossed at several places the ancient cobble-paved Cortez highway, still in good condition but no longer used.

At the first commanding view of the hills and valleys about Tenancingo we were amazed at the great number of bench terraces spread out over the far-reaching landscape. It was an astonishing sight—a view depicting the earthy products of a prodigious expenditure of human labor.

At close range, some of the terraces were found to be flat-topped and in good state of preservation. All of these flat benches were in cultivation. Other terraces, on steeper slopes, supported by rock walls that usually were invisible because of a covering of accumulated erosion material washed from above, seemed rather too far apart for the declivity of the land. An additional wall between probably would

have made most of the terrace-interval flat or nearly so, and less subject to erosion.

We asked a farmer working in a cornfield if he would not stand by the lower side of the supporting wall immediately below, to show its height in a picture. He said, very politely but firmly: "No; it is absolutely impossible for me to allow my picture to be made in another man's field; here in my own field, however, you may take my picture as you please."

I failed to learn whether this farmer's decision had to do with pride in his own field, which was a nice looking field, or was merely a matter of hesitancy about taking liberties with another person's property.

Cultivation between the terraces is generally well done, on the contour, both with hand work and plowing. A recent very heavy rain had cut through several corn rows in one field we went into, but the farmer had promptly closed the incision with earth. In places erosion has overcome and ruined some of the steeper terrace intervals, especially where careless cultivation has been done or where the retaining walls have fallen and been allowed to remain unrepaired.

In general, however, it would be difficult for the walls to fall, since many of them are completely covered with soil and are thickly grown up with a small-fruited peach and other fruit trees and shrubs of good stabilizing value.

Who built these terraces, and when, we were unable to ascertain. True, there was little time for investigation, but the answers to what inquiries we made were on the order of *quien sabe*.

We saw little evidence that modern man is constructing any more of these worthy structures. They may have been established a hundred years ago, two hundred, three hundred, or longer—who knows? At any rate they represent a splendid achievement in the field of mechanical soil conservation—an outstandingly efficient method for holding soil up on the very same slopes where nature manufactured it.

Another question that got tangled in with our observation about physical land conditions in Mexico—and we did not find the answer—was: Why so many of these laboriously built conservation structures in some localities and no structures of any kind and no evidence of any other conservation effort in other localities not far away? Was it a

The terraces of Tenancingo.

Ruins of Hacienda del Moleno. This one-time magnificent structure, erected out of the wealth of the soil, has gone with the eroded land.

matter of local culture, of tribal enforcement, of the experience of some outstanding farmer?

Across the valley, in an easterly direction from the town of Tenancingo, we walked up a long slope practically all of which was cultivated or had been cultivated. For the most part, especially over the steeper upper half of the hillside, the land was not terraced, although at considerable intervals hillside ditches had been installed. Some of the cultivated upper slopes had a declivity of around 100 percent. Erosion was generally severe—so severe that some fields had lost all the topsoil down to tough, infertile clay that produces only 3 or 4 bushels of corn to the acre—or no corn at all. In still other places, now abandoned, even the subsoil was deeply gouged.

To Tlaxcala

It is an interesting trip to the ancient State of Tlaxcala. You cross the mountains east of Mexico City, enjoy splendid views of Popocateptl and Sleeping Lady (Ixtacihuatl), and pass through beautiful pine forest in the National Park along the crest of the range. The highway is good all the way—well paved, with easy grades.

Most of the forest has a dense ground cover of sacaton grass. There was not much evidence of fire damage, although 2 years previously I had seen smoke at a distance from several fires burning along this range—probably small local fires. The pine trees (Montezuma and Ocote species) showed no evidence of charring.

Dropping down into the village of Rio Frio, we had another breakfast for the day (it isn't nearly so important a matter to record the precise number of breakfasts or other meals one eats on the Plateau of Mexico as it would be to miss anything so delicious as that morning's *tacos de carnitas*, served with *guacamole*.)

Beyond Rio Frio the country is generally smooth, with slopes not usually over 4 to 6 percent. Here is yellowish sandy loam soil overlying tepetate. Most of the land is cultivated, but erosion is fast becoming an important farm problem. Conservation work should be started here without delay; the land is not greatly different from that we saw a little later in the same day, where erosion has made thousands of acres permanently worthless by stripping off all the soil and all the subsoil down to the parent rock.

An occasional farmer in this moderately rolling section east of Rio Frio has installed a kind of hillside ditch to cope with runoff and help to curb erosion. Beyond this, very little is done in the way of control.

This section includes much land where terracing, contouring, and strip cropping probably could be installed easily and with good results.

The end of a once-productive field: soil and subsoil stripped to the bedrock. The pedestal in the background indicates the extent of erosion. Near Tlaxcala, State of Tlaxcala.

Near Santa Justina we saw a number of "flying rivers," and a fair-sized area of bare alkali land on the broad-floored flat valley of one of the tributaries of Rio Atoyac. Much of the better land here is used for corn. Most of the crop is grown on small mounds—"hills"—built up with hand labor.

It was here that I first became acquainted with the Mexican custom of rural people having their homes in villages instead of out on their farms. Perhaps the differences between these two ways of living is not so great as might seem, so far as getting the farming job done is concerned.

But I did come suddenly to realize the very different appearance of things at about 12:30 p. m. At that time every farm worker—plowmen, and men and women with hand tools—who a little while before had been scattered at work all over the plain, quit their labors and set out for their home villages, some following the highway to the east, and others dispersing to the west. All through the more important agricultural sections of Mexico there are a great many villages, and you don't have to go far to get to one.

Later that day, after we reached the more seriously eroded lands, I tried to find the remains of former habitations. Failure to locate such ruins again focused my thoughts on the national differences in rural modes of living.

In the country around Mexico City many of the names are none too easy for outsiders. For example, when we went down to the sarape factory at Santa Ana Chiautempan, situated on the headwaters of Rio Atoyac, in Tlaxcala, we discovered that we were more or less surrounded by such communities as Apetatitlán, Cuahuixmatla, Tepatlachco, Tzompantepec, Yauhquemehcan, Tlahcuilohcan, Amaxac, and Huiloac.

But these things all work out very nicely. Within a few days one learns to pronounce more or less passably the name of one place, after which the problems of Aztec and Tlaxcalan spelling and pronunciation eventually work themselves out.

From Tlaxcala, in the State of Tlaxcala, whence came the Indians who aided Cortez in overthrowing Montezuma, we drove easterly beyond Ocotlan through the low country along the northerly foothills of Mount Malinzin.

It was here that we found so much of the very bad type of erosion. It reminded me of conditions we encountered in the Andes Mountains 6 months previously, where the effects of erosion were so terrible in some places that one of the conservation technicians got to turning over in his mind the possibility of inventing a special term for land that has been eroded to the finish.

These Tlaxcalan lands, too, have been stripped of

all their soil, right down to the hard skeleton of bedrock. And I doubt if much could be accomplished by any attempt at further detailed description of such gaunt, denuded areas. Certainly, they can't wash any more; they have passed from the agricultural status to that of mere geological materials.

I had seen many areas of such land before—in my own country and in other countries. And about the only thing I could say to my Mexican friends was that no agricultural country anywhere in the world could afford to postpone the vitally important matter of stopping abruptly the process of gradual soil impoverishment that leads ultimately to dead land, dead nations, and dead civilizations.

We tried to find out why some areas in close proximity to the devastated tracts had been saved by bench terracing mostly built with the aid of maguey plants grown in rows along the contour, while larger areas had been left entirely unprotected. It seemed to be the general opinion that a combination of things had taken part in the tragic downfall of probably more than 200,000 acres of formerly cultivated land in the State of Tlaxcala alone. Unfamiliarity with the deadly effects of erosion undoubtedly played an important role, and exploitive farming was another factor. People don't go out and deliberately destroy their farm lands. Such abuse as does occur develops from human weaknesses that are age-old and world-wide—the inclination to look upon productive soil as little more than common dirt, not subject to change and valuable only for what it will produce at lowest cost.

We drove on as far as the ruins of the great building that formerly was headquarters of Hacienda del Moleno, situated near the banks of Rio del Molena. This expansive structure, completely deserted and rapidly disintegrating, once enclosed a chapel, a mill, baths, and comfortable quarters for a large number of people. The wreckage of masonry stands as a dismal monument to the process that laid low the land—the land from which once came prosperity and well-being.

No people can afford to look complacently upon such overwhelming disaster as the decline and loss of its basic resource of productive soil.

Fortunately, Mexico has just recently set up a Soil Conservation Service under the direction of Ing. Sr. Lorenzo R. Patiño.

It was Director Patiño who took us out to see the severe erosion of Tlaxcala, which he says is destined to undermine and ruin the economic life of that State if it is not stopped very soon.

At the Second Inter-American Agricultural Conference one of the resolutions adopted had to do with soil and water conservation. This historic document (Resolution No. 30) was published in the October issue of SOIL CONSERVATION, translated from the Spanish.

The erosion of unprotected snow. Earliest use of Mount Rose snow sampler, on Mount Rose. The sampler is still primitive in length, strength, and efficiency.

Organized Water

By J. E. Church[1]

The Central Snow Conference, at its December 1941 meeting at Michigan State College, signalized the maturity of snow surveying by giving the writer a citation of appreciation and confidence.

This citation was immediately "dedicated to the Nevada Agricultural Experiment Station and particularly to Director Samuel B. Doten, whose initiative made possible the inception and progress of the work." With them should be associated in memory President Joseph Edward Stubbs of the University of Nevada who believed farther than others saw; Paul M. Norboe, Chief Assistant State Engineer of California, who gave snow surveying continuing life in its darkest days; and Governor Emmet D. Boyle of Nevada, who created the first State cooperative snow surveys.

But associated with snow surveying, like atmosphere, are scores whose personalities are inseparable from the work. These, particularly Charles A. Mixer and Robert E. Horton, reach from the earliest days and from the far places of the continent. To all of them the citation also belongs.

Although one-fourth to one-third of the land surface of the Earth has a seasonal snow cover,[2] the role of the snow in the annual water cycle was poorly comprehended at the beginning of the century, and its seasonal assets were almost wholly

[1] Meteorologist, University of Nevada, Reno, Nev.
[2] Robert E. Horton.

unknown. Thus the span of active snow surveying now scarcely exceeds 30 years, and the pioneers are still the leaders while those who gave them aid and comfort are strong incentives and cherished memories.

First of the pioneers were Mixer and Horton. In 1900 Mixer, civil engineer, measured the water equivalent of the snow cover in the Androscoggin Basin, Maine, to determine its relationship to the spring flow of that stream where logs were floated to market and power was generated. Horton, hydrographer of the United States Geological Survey, in 1903–4 made the first American snow-sampler for cutting and weighing snow cores and prepared a map of the snow cover for New York State.

In the far West, quite unaware of these beginnings and stimulated by the desire to aid in settling the bitter dispute regarding the value of forests and mountains in conserving snow, the writer developed the Mount Rose snow-sampler in 1908–9, and with it charted the water equivalent of the snow cover in long traverses over the various types of mountain and forest slopes of Mount Rose (10,800 feet above sea level).

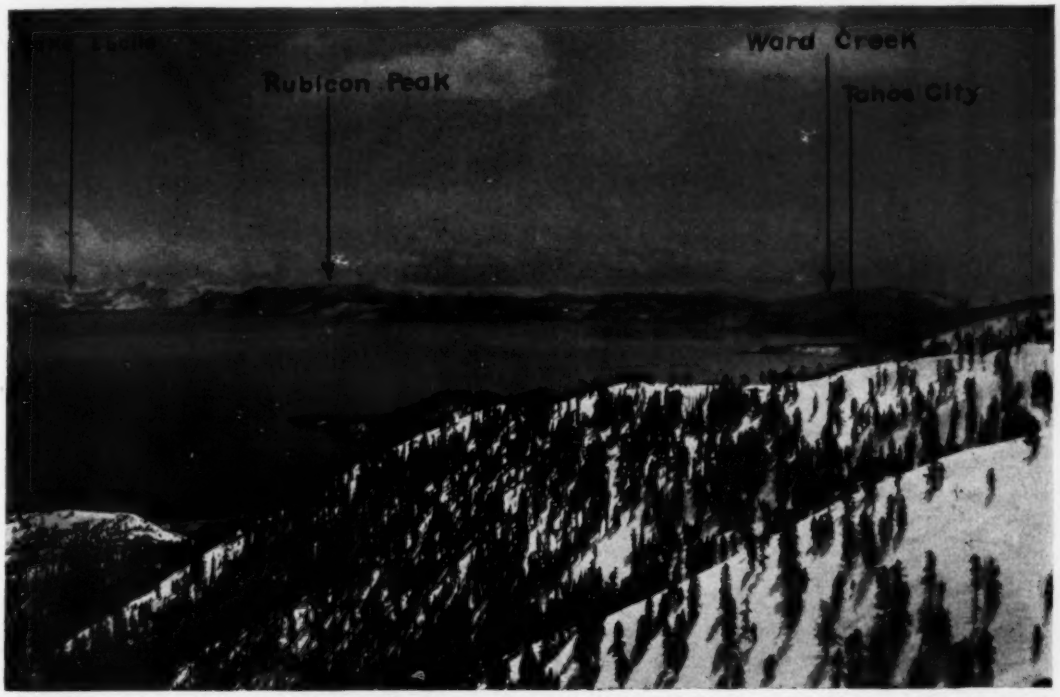
A mobile snow-survey camp on Lake Tahoe. The lake never freezes, thus affording a 72-mile coast line for reaching various types of snowfields.

Here overlooking Lake Tahoe—the source of the first United States Reclamation Project—and the recipient lands far in the dim desert to the east, the following forecast for irrigation was made for the season of 1911: "On Mount Rose the amount of moisture in the form of snow available for irrigation the present season was 44.4 inches, or almost double the amount (23.5 inches) available last season. Furthermore, on account of the lateness of the spring, 38.3 inches of moisture were available as late as June, whereas only 7.2 inches were available a year ago." Meantime, in the Wasatch Range of Utah, in March 1911, J. Cecil Alter of the United States Weather Bureau inaugurated a snow survey in Maple Creek watershed which indicated that the snow-water of this stream "would spread 14 inches deep over the 5 square miles of rich fruit and farm lands reached by it." Each of us knew nothing of the work of the others in the days of its inception. Snow surveying must have been in the air.

As already seen, the Nevada method was simple, consisting merely of a percentage relationship of the snow cover at its maximum, April 1, to the average or normal, and the application of this percentage to the normal of the streamflow from the snow cover during April–July, the period of snow-water runoff. Accuracy within 10 percent is usually attained, and the percentage of seasonal snow cover has been found so uniform over distances of many miles that the percentage in one basin can be applied to its neighbor. A few snow-survey courses will thus serve a wide area. Furthermore, costs of snow surveying are low. From this harmonious relationship of snow to runoff has been developed the science of snow surveying and streamflow forecasting—and the implicit confidence of water users.

State and provincial cooperative snow surveys have spread from Nevada to Montana-Alberta, Utah, New York, Oregon, California, British Columbia; and individual surveys have been organized in Wyoming, Washington, Newfoundland, Quebec, New Hampshire, Pennsylvania, and abroad in Sweden, Australia, and India. In 1935 the Federal-State Cooperative Snow Surveys were inaugurated by the Division of Irrigation, now a part of the Soil Conservation Service, to cover the Western States as a unit. Federal, State, municipal, and private organizations have united in common interest while Eastern, Central, and Western Snow Conferences have divided the snow States between them to adapt snow surveying to their local needs, whether irrigation, power, navigation, municipal water supply, or defense against floods or the effects of drought.

The benefits have been both tangible and intan-



Lake Tahoe, source of the first U. S. Reclamation project and scene of early streamflow forecasting. The names indicate snow-survey courses.

gible. The latter are the greater, for rivalry (originally river contest [3]) is ceasing and cooperation and confidence are taking its place. No higher praise has ever been given in water disputes than when it was said of A. V. Tallman when water master in Idaho that "He brought peace to the Boise."

Lake Tahoe is likewise a symbol of peace after storm. In 1910, after a period of uncontrolled water that had risen in 1907 to 1¼ feet above the dam, the lake residents threatened to blow out the dam unless the water was drawn far down each autumn. Appeal was made by the power company controlling the gates for the use of snow data from Mount Rose to estimate the seasonal lake rise. This year, 1942, when the lake once more began to rise above its limits, the lake dwellers complacently viewed the discharge of excess water until the maximum level was brought to rest 0.09 feet below the point fixed by Interstate and Federal agreement.

Confidence in the snow surveys was so quickly built up with the legislature of the State of California that in 1920, when the lake was sinking steadily toward its rim, no protest was made at continued withdrawal of water for power; and in 1924 the civic interests of California granted permission to the irrigators in Nevada to pump from the lake, on the assurance that its normal water level would ultimately be regained.

The tangible benefits of snow surveying also have been widespread. To draw an analogy from banking, the distribution of water is no longer regulated by the accumulated storage in the reservoirs but by the indication of the snow fields. In the early days of the Los Angeles Aqueduct, plans were made to divide the available water equally between Owens Valley and Los Angeles each season on the basis of snow surveys, but ultimately all water rights were purchased by the city.

In the adjoining Walker Basin, however, distribution was on the basis of priority from accumulated reservoir supplies, until one backward spring, when streamflow started late, new settlers on the East Fork, without early water rights, begged reservoir water to save their crops and their farms. The water board resolutely refused to "apportion what they did not have" but quietly advised the project engineer "to slip them a little" on his own responsibility and the assertion that an 80-percent snow cover was on the watershed. Next autumn the en-

[3] *Rivus*, Latin for river; hence rival is a river man.

gineer proudly placed conspicuously in the center of the front page of the local paper the news item "Forecast proves accurate and saves crops." Since that year priorities have had only a broad significance in that area.

To go beyond the bounds of banking into financiering, depressions in water supplies, commonly called drought, have been foreseen and adjusted before they occurred. A classic example has been provided by Utah and is best given in the words of George D. Clyde who organized and has long conducted the Utah Cooperative Snow Surveys:

"Snow surveys and streamflow forecasts were begun in Utah in 1923. In 1926 the first water shortage occurred. No quantitative measurements of probable shortage were available, but the deficient snow cover indicated a water shortage and a general curtailment of late-season crops followed. Those who reduced their late-season crops matured what they planted. Those who planted regularly did not mature a full crop. Much of their labor and seed was wasted. Five years later, in 1931, another drought was evident before the beginning of the planting season. This year the sugar companies would not contract beets until the water-supply forecast was available, and the banks would not lend money on crops before the extent of the probable water supply was known. As a result of these precautions most of the late-season crops that were planted were fully matured and the effects of the drought materially reduced.

"The drought of 1934, which was the most severe in the history of the West, taught many lessons, the most important of which was the necessity of having a full knowledge of an expected drought prior to the beginning of the planting season as well as full cooperation among users of water. Any year may be a dry year, but the probable extent of the drought which follows a deficient precipitation can be ascertained by a measurement of the accumulated precipitation which is stored in the form of snow on the high watersheds.

"It was known from mid-winter snow surveys over the Utah Snow-Survey Network as early as February 1934, that Utah was facing a serious drought. There was an extremely light accumulation of snow on the high watersheds and the earth mantle under the snow was dry. The lower watersheds were completely devoid of snow and the valleys had experienced only light precipitation. This early warning was emphasized by deficient precipitation during the months of February and March, and on the first of April, as a result of measurements made under the State-wide network of snow surveys, it was clearly indicated that Utah faced the worst drought in her history. At that time the potential water-supply did not exceed 35 percent of normal. The conditions were brought to the attention of the farsighted Governor of Utah on April 1 and he immediately set in motion machinery necessary to meet the situation. He called the first drought conference in history to be held before the drought occurred. At this conference two lines of action were developed: First, to put into effect immediately a water-conservation program, and second, to begin immediately the development of supplementary water supplies so that they might be available by the time the crops needed the water.

"The water-conservation program involved an educational campaign to acquaint the water users with the situation and with the essential modification of acreage to be planted, methods of irrigation, and administration of the water to secure maximum use of the water available. Unusual as it may seem, the water users of the State, in the main, were unaware of the seriousness of the situation. They had not been in the habit of considering their water supply above their headgate. They assumed that water would come because it had always come before, and they did not take into consideration whether or not there was any water on the watersheds to supply the streams.

"As soon as the water users were convinced that a real shortage of water existed, they began planning and executing a program to combat the drought. They did not wait until the drought was upon them before beginning operations, and as a result they matured most of the crops they planted. They saved their orchards and perennial plantings, they moved their livestock off the ranges and out of the State before they starved, and they developed supplementary water supplies for irrigation and domestic purposes before the ordinary sources of supply dried up or got so low as to be insufficient to meet the minimum demands.

"The water-development program which was inaugurated upon the issuance of the water-supply forecast enabled the State to develop approximately 400,000 acre-feet of water in time for use in saving crops. Estimates based on measurements made during the season of 1934 indicate that a saving in crops alone due to the program of water conservation and development of supplemental water supplies was over $5,000,000 in Utah. On the Bear River, which supplies lands in Utah and Idaho, a total of 150,225 acres were supplied with supplemental water by this program. It resulted in a saving in crops of $3,149,000 in Utah and $684,000 in Idaho, or a

total saving of $3,833,000 in the two States. In addition to this, a tremendous saving in livestock was effected through the Federal purchase plan which took the cattle off the ranges and out of the State before they starved or chocked to death.

"The water-supply forecasts enabled municipalities to inaugurate early a water-conservation program and a supplementary development program which gave them sufficient water in most instances to carry them through the drought. It enabled power companies to provide supplemental steam-power in advance of its needs. Early warning of a water shortage enabled Salt Lake City (population 125,000) to develop a supplemental water supply of 40 to 50 second-feet from ground-water sources to avert a serious municipal water-supply shortage. Many small communities actually had to haul water for a short time until the supplemental supplies could be made available. These latter benefits cannot be evaluated in dollars and cents, but they rank high in prevention of human suffering and perhaps death."

Supreme in the annals of confidence and self-control where once water feuds existed, was the quiet acceptance in the Humboldt Basin, Nev., of a forecast in 1931 of only 10 percent of normal seasonal runoff and corresponding allocation of the scanty water to prior rights along the stream. A judge on the bench seldom inflicts a community sentence like this, nor was ever a judge more thankful that his judgment was true.

At the other extreme are floods that are frequently the creatures of more active elements than the snow but may be controlled by it. The value of the quantitative system of snow surveying in the Androscoggin Basin, where streamflow forecasting had its birth, is remarkably demonstrated by the timely warning of Paul L. Bean of the disastrous flood of March 1936 in New England.

To paraphrase Mr. Bean's report, a very thorough snow survey in the Androscoggin Basin indicated about 10 inches of water on the snow at the lower levels and 12 to 18 inches at the higher levels—an unprecedented condition, indicating a potential volume of flood water to pass Lewiston of not less than 60 billion cubic feet. The basin embraced slightly less than 3,500 square miles, of which two-thirds was entirely uncontrolled except for natural storage. As high altitudes predominate in the uncontrolled drainage area, it was clearly evident that if heavy precipitation accompanied by high temperature should occur, a flood of major magnitude could be expected. Moreover, the snow cover extended far to the south, was heavy, and showed little

An ideal glade for conserving snow. There is little interception but much shading. It is finally good practice to cut the forests into glades, since water has become as valuable as timber.

sign of melting. This condition clearly pointed to a sudden break, which actually occurred March 13, when the other necessary elements were provided to produce the greatest flood in this area within the memory of man.

It was the supreme experience of life to see a flow, greater than normally passes Niagara Falls, hurtling down a channel with a normal average flow of 1,800 cubic feet per second. Damage ran into millions of dollars; but there was no loss of life due directly to the flood, though several persons were so frightened that they died of heart failure.

Foresight and adjustment are the keys to water supply. The most recent experience is again the control of Lake Tahoe during the present season, from oversupply and the conserving of a deficient supply in the Androscoggin Basin. Mr. Bean again tells the story: "In this area it is interesting to note

(Continued on p. 115)

Some of the landowners agreed to install their own dams, especially if the structures were comparatively small. This is a downstream view of Hester's Dam on the Rio Hondo, built by the landowner. The dam is two logs high, with brush and rocks piled on the upstream side of the logs. SCS hauled logs to the dam site.

SCS HELPS NEW MEXICO FARMERS TO REPAIR FLOOD DAMAGE

BY DUNCAN SCOTT[1]

In Lincoln County, New Mexico, two small streams—the Rio Bonito and the Rio Ruidoso—wind through narrow mountain valleys and come together to form the Hondo River, which flows eastward past the city of Roswell. Some 208 families live in the Ruidoso and Hondo Valleys and get most of their food and income from the 6,000 acres of irrigated farmland that borders the streams. Though limited in area, the arable land is fertile and yields excellent crops of apples, vegetables, small grains, and hay.

Ordinarily, life in these valleys is pleasant. But in September 1941, two terrible floods, spaced exactly a week apart, roared down the twisting channels. The second flood, on the 28th, was more damaging than the first. Following a series of heavy rains that had completely soaked the ground, a deluge of 7 inches fell within a few hours on the Lincoln National Forest, which drains into the valleys. Water poured down the mountain slopes, gained momentum, and swept through the valleys in boiling fury.

Forty-one of forty-three rock and log diversion dams in the Ruidoso and Hondo Valleys, used to raise water to the fields, were washed out. Hundreds of apple trees, heavy with fruit, were uprooted and destroyed. Great holes were slashed in the land. Thousands of tons of silt and debris were piled on fields. Altogether, 1,800 acres of farm and orchard land were either completely destroyed or severely damaged, causing a total damage estimated at $500,000. The tail-end of the floods broke over the banks of the Rio Hondo and inundated a large part of Roswell, a city of 15,000 population.

Since an important railroad has water rights in the Bonito Valley, the company agreed to rebuild diversion dams that were destroyed there. But that left a large reconstruction job still to be done by private citizens in the Ruidoso and Hondo Valleys.

At the very time that the floods struck, farmers were organizing the Upper Hondo Soil Conservaion District, and they asked their district supervisors to seek government aid in the rehabilitation work. O. B. Shook of Capitan, district chairman, A. T. Pfingsten of Hondo, vice chairman, and W. F. Coe of Glencoe, secretary-treasurer, went immediately to the Soil Conservation Service and to other agencies with their problems.

Word was passed on to the Soil Conservation Service regional office in Albuquerque, and soon engineers from that office and from the Las Cruces, N. Mex., area office were detailed to the area. W. B. Wroth, engineer for the Southern New Mexico Area, was placed in charge of engineering field activities, and C. A. Henderson, unit conservationist at Capitan, began the difficult task of planning flood reconstruction agreements with 208 different landowners.

Several local factors complicated the task of clearing away debris, repairing irrigation ditches and intake structures, and rebuilding the dams. First of all, many of the residents are low-income farmers who cultivate only a few acres on a family subsistence basis. This condition has arisen because a number of tracts, originally homesteaded, have been split among the heirs until often only a narrow strip of land is left for the family head. Thus, many landowners had little money for dam building, but they had to get water on their fields again if they were to raise crops in 1942. The second difficulty was caused by the flood itself, which widened and deepened the river channels, demanding larger dams than those that originally stood in the streams and threatening a lowering of

[1] Division of Information, Southwest Region, Soil Conservation Service, Albuquerque, N. Mex.

the water table in orchards. In the third place, time was limited. Engineers had only about 90 working days in which to construct sufficient dams to raise water to field level.

Despite great difficulties, most of these problems have been solved. The Service engineers surveyed each dam site and drew up specifications for the new structures. Under supervision of the Forest Service, CCC men at Camp 32–N, Hondo, have cut 7,500 logs on the Lincoln National Forest and hauled them in trucks to dam sites. One dragline was brought in by the Soil Conservation Service, and another was borrowed from the Fish and Wildlife Service of the Department of Interior. The State engineer's office let the district have trucks and other badly needed equipment.

By the middle of March, 15 log and rock crib dams had been completed, and the Service engineers were rushing to finish 10 more dams by May 1. Since the people living in the valleys had agreed to let 1 dam serve a number of farms by building flumes and lengthening irrigation ditches, nearly everyone will have water for crops this year. The most heartening thing that has arisen from the disaster is that landowners are working together, forgetting petty disagreements and selfish interests and contributing much of the materials and labor for the dam building.

When Mr. Wroth and J. G. Lindley, regional engineering chief, surveyed the destroyed dams, they realized that they must plan strong new structures that would cost as little as possible. For that reason, they agreed on the log and rock crib type of diversion, but, even so, the dams are costing from $2,000 to $8,000 each, if one includes the cost of materials and labor supplied by landowners. One of the dams, for example, is 84 feet long and 12 feet high. For some of the farmers, who chose to rebuild their own dams, the Soil Conservation Service crews hauled logs to the dam sites but did not assist in the actual dam construction.

The oldest people living in the Hondo and Ruidoso valleys say the floods were the most severe of any within their memory. Yet, they are looking to the future with optimism, now that Government agencies have helped in solving their immediate and most pressing problems. The attitude of W. F. Coe, member of a pioneer New Mexico family, is fairly typical. Coe lost 300 mature apple trees and suffered total damage which he estimated at $10,000, but he recently said: "I've been in this valley a long time. My father got his start here in 1875 by trading a buggy and team for a 2-room house and a small farm. I intend to stay here. Everybody has pitched in and helped the district, and it looks as if we will get everything straightened out in time."

Just down the valley a few miles from the Coe place, across the Rio Ruidoso from the small village of San Patricio, is the 600-acre ranch and farm owned by Peter Hurd, nationally known Southwestern artist. Hurd, who lost above 5 acres of orchard land during the floods, is a conservationist at heart and has worked whole-heartedly in forming the district and in getting community action to repair flood damage. Hurd believes that flood reconstruction is a temporary program, but he sees that soil conservation is a long-term problem.

He tells an anecdote that bears repeating. One day, an old Spanish worker pointed to the hillside and said to Hurd in the Spanish language, "I tell thee, Pedro, the rocks are getting bigger." Hurd shot back immediately: "No, my friend, the rocks aren't getting bigger—the soil is washing away. If this land hadn't been abused so much in the past, we wouldn't have such big rocks and gullies today."

The people of the Hondo and Ruidoso valleys are becoming more conservation minded. The floods brought them together, as disasters usually bring people together. Gradually, all necessary dams will be rebuilt and the fertility of the valley lands will be preserved.

(*Continued from p. 113*)

that, as a result of my snow surveys, I did obtain as much water in the lakes, and a little more, than the snow surveys indicated; the water content of the snow was not enough, however, to provide a fill unless we received average rainfall during the months of April and May. I went through the winter operating on the basis that during the months of April and May I could rely on approximately 50 percent of the average rainfall. As a matter of fact, we received practically none and my failure to obtain a 100-percent fill was almost entirely due to this drop in rainfall. Other areas in this State, which pay little attention to the water content of the snow, are practically empty today, whereas my reserves are from 42 to 43 percent full."

Thus in this year of world dislocation, the water resources of the North American continent—the continent that must be the source of ultimate world recovery—are fully known and are yielding maximum efficiency. They are, moreover, almost without exception, in superabundance. The original incentive to increase water supplies by conservation has grown into an international system of water appraisement and control.

For the third straight year, the Governor of South Dakota proclaimed a Conservation Week for that State. This year's dates were September 13 to 19. Governor Harland J. Bushfield, in his official proclamation, put soil erosion's cost to the United States at about four billion dollars per year. He included the safeguarding of water resources as a part of the conservation necessity, called special attention to the desirability of providing for wildlife. He urged schools, civic groups, sportsmen's organizations and soil conservation districts to observe the week with appropriate educational programs.

FAMOUS AGRICULTURAL SOCIETY HAS IMPRESSIVE RECORD

BY C. R. ENLOW[1]

Service personnel stationed in the Pee Dee Soil Conservation District in South Carolina are extremely fortunate—this is my opinion after attending a meeting of the Darlington County Agricultural Society. In its Agricultural Society, Darlington County, which is entirely in the Pee Dee District, has possibly the oldest farmers' organization in the United States.[2] The members of the society are well-informed, cooperative men, intensely interested in the soil and what it produces. The society is 97 years old. The Pee Dee District is 2 years old. The toddling infant has an old timer to help guide its wavering steps in the right direction.

The Darlington County Agricultural Society held its 97th Annual meeting at Mineral Springs on August 11. Dr. R. F. Poole, President of Clemson College (S. C. A & M) introduced the subject for discussion, namely, The Farmers' Part in the War Effort. Other speakers pointed out direct contributions that farmers could make through the liming of their soils, planting forage crops, practicing soil conservation, the growing of peanuts, and the production of hogs. Thus does the Society keep abreast of the times after almost a century of useful endeavor.

According to J. M. Napier of Darlington, the present secretary to the Society, it was organized May 5, 1846, with 56 planters enrolled as charter members. In the minutes of that meeting this statement is found: "A proposition was made to adopt for the government of the Society, the constitution framed for a Former Society at this place." This proposal was accepted, and W. E. James was elected president and W. H. Wingate, secretary. Unfortunately, there is no information to indicate when the "Former Society" was organized or who were the far-seeing planters who set in motion an educational movement that has continued to influence their descendants through the fourth and fifth generations.

At the time of organization, standing committees were appointed ". . . to deal with the various subjects connected with agricultural industry . . . seek out and obtain the most correct and practical information . . . and report the same . . . for discussion and general consideration of the society." In its essential features this practice has been continued by the membership to the present time.

The programs of the organization impress one with the timeliness and practical nature of the subjects that have been under discussion throughout the decades. Prior to the War between the States the reports of the committee on "Treatment and Management of Slaves" received most attention. Likewise, in 1865 the subject was "Rules of Plantation Discipline and Wages, which if generally adhered to, would promote the interest of the landowners and secure just compensation and proper treatment to the laborers." The society pledged itself to further this relationship.

From its beginning the Society has encouraged and sponsored many things which the members felt would further agricultural development in their State. Subjects such as soil building, rotation, manures, fertilizer, improved seed, development of livestock, pastures, forage crops, gardens, orchards, small grain, plant diseases, and insects, together with better methods of producing cotton, corn, and tobacco, have all occupied prominent places on the programs presented at the annual meetings of the Society. The tariff, farmers' organizations, taxes, cooperative marketing, the AAA, freight rates—all these have received their share of attention. As long ago as the 1850's some of the members were conducting experiments with various crops and reporting their findings to the Society. Seventy-two years ago the Society developed and launched a county fair, and 69 years ago acquired a tract of land to be used as an experimental farm.

The records reveal that from generation to generation fundamental subjects relating to the agricultural welfare of the State have challenged the thoughts and interest of the Society. Of its membership and leaders none has striven more patiently, more unselfishly, more effectively or with more far reaching results than did those two patriotic South Carolinians, David R. Coker and E. McIver Williamson.

The late Mr. Coker is known throughout the cotton-growing regions of the world for his work in improving the staple, quality, and yield of cotton; likewise, the late Mr. Williamson revolutionized the production of corn throughout the South with the development of the "Williamson Method" of corn production.

In a State that at times has experienced partisan politics, it is significant that the Society never has been touched by any political influence. In reviewing its history one is impressed by the continuity of family names. Sons have succeeded fathers in manifesting their interest in the organization. At any meeting of the Society one will find present a liberal number of descendants of the original charter members.

Interest in the meetings of the Society has never waned. It has survived wars, reconstruction, depressions, and prosperity. Since its organization it has missed holding only one annual meeting and that was in 1864. Records reveal the reason: "all the men were in the Army."

Life in the soil is susceptible to nutritional deficiencies. A balanced bacterial diet is a factor in crop production.

In considering ecological aspects of farming, food and nutrition must come first, comfort later.

SEEDING SMALL GRAIN

In drilling small grain, sufficient residues should be left on the surface between the rows to give protection against water and wind erosion until the young plants develop sufficiently to protect the soil. The common wide-space drills may be used with fairly good results. Where the residue is heavy, drilling small grain is rather difficult. Several new types of drills have been tested.—From the new Miscellaneous Publication No. 494, U. S. Department of Agriculture, "Using Crop Residues for Soil Defense."

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[1] Chief, agronomy division, Soil Conservation Service, Washington, D. C.

[2] Information concerning other agricultural organizations that have been functioning for long periods is solicited by the author.

Conservation on the march in Puerto Rico.

Employees of the Soil Conservation Service participated in a Fourth of July parade in Mayaguez, Puerto Rico. All sections of civic life in this town of 55,000 population were represented. SCS employees themselves paid for and constructed a float and other displays, and joined in the marching. Slogans proclaimed soil erosion an ally of Hitler and enjoined Puerto Rico to "fight it." In conjunction with a picture of General MacArthur was the statement, "He needs food for his army." Sandwich-board signs declared, "Without soil, there is no production of food" . . . "Without food, we have no soldiers."

"We came thru the Dec. 7th episode without personal injury or losses, but with a new experience which we trust will not be repeated, and grateful that all our children were on the mainland. We live a changed life here today, under the military Governor set-up, but are suffering no actual hardships or real essential privations, and we know that the change is necessary. Our research, though restricted in scope and volume, goes on as best it can with the efforts of our reduced staff. Shortage of field labor to get the actual field work done, is our greatest handicap."—Part of letter to A. E. Brandt, Soil Conservation Service, from R. J. Borden, Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu.

I do think the Tar Hollow Nutrition Conference was one of the best I ever attended. It seemed to have the unique characteristic of falling within a common compass of a group of varied specialists, and I suspect that that common denominator was a fundamental interest in the health and consequent happiness of man.—John D. Detwiler, President of Canadian Conservation Association, London, Canada. (See October *Soil Conservation* for report on this conference.)

"I recently obtained from your Department 16 mm. sound on films, Muddy Waters, Rain on the Plains, Grasslands and Forests. I have shown these to most of our Cabinet Ministers and Members of Parliament, and our Prime Minister, Sir Godfrey Huggins was particularly interested. They commented on the great similarity of the conditions of some parts of U. S. A. to those prevailing in Southern Rhodesia. Our Information Officer is now showing these films to farmers, and our Native Department is then to take them over for use in the Native Reserves. We are very grateful for the help that we have been able to secure from your Department."—Part of letter to Wellington Brink, Soil Conservation Service, from A. S. Bright, principal, The Salisbury Polytechnic, Salisbury, Southern Rhodesia.

"My own experience has shown me that teachers often lack three things—actual information, proper viewpoints and teaching methods. I think our Laboratory is designed to give the attending teachers all three of these things. In Science, taxonomic studies are important. We must know the names of things because they are the building blocks of our environment. But the meat of the matter lies in the relationships which exist between these things. There is a profound ecology between a limestone pebble and the size of a farmer's silo and Science does not become education until we see it. And, not only must the teacher see it, she must know how to make her pupils see it—that's where the teaching methods come in. That is the job of the Conservation Laboratory, as I see it."—Part of letter from Arthur R. Harper, field naturalist, Conservation Laboratory, Tar Hollow, Ohio.

Small Gleanings

Large sand dune completely stabilized by beach plum.

Beach plum, a soil-conserving hilliculture crop plant, recently won first prize for Jackson M. Batchelor, formerly soil conservationist, hilliculture division, Soil Conservation Service, now a lieutenant in the Army Air Forces at Miami Beach, Florida.

A fund was established in August 1940 by James R. Jewett of Woods Hole and Cambridge, Mass., from which two prizes were to be given annually for the scientific development and culture of the beach plum. Income from the fund provides a $100 first prize and a $50 second prize each year. The first prize is known as the James R. Jewett Prize and is awarded "to the person or persons making the greatest contribution to the scientific development and culture of the beach plum."—Hilda Cunniff, Hilliculture Division, Soil Conservation Service.

On a typical Piedmont tobacco soil, one year's results indicate that soil loss tends to increase rather rapidly as the grade of the rows increases. Drainage, on the other hand, was practically as complete with 6 and 12 inches fall per 100 feet as on the higher grades.

Crop juggling is no substitute for soil fertility.

BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neall Faris

THIS LAND WE DEFEND. By Hugh H. Bennett and William C. Pryor. New York and Toronto, 1942.

In this book, just off the press, the Chief of the Soil Conservation Service and his associate attempt to cover an audience not yet reached by authoritative writings on the soil erosion problem in our country. The relatively small volume is in marked contrast to Dr. Bennett's "Soil Conservation" published in 1939 and now accorded world-wide acclaim as one of the most impressive and useful books of the century. "This Land We Defend" is in the style of the motion picture commentary, and much of the story is told by full-page photographs showing spectacular soil erosion caused by land exploitation and contrasting views showing the new pattern of conservation farming.

The historical *motif* is used throughout the book to present the facts about what we have done through three hundred years to bring our agricultural land to the point of requiring extensive overhauling to put it in shape for further profitable agricultural endeavor.

The latter part of the book in particular constitutes a sharp warning to us all—not to forget in the midst of war demands that conservation of the soil must go forward without interruption if we are to avoid a second post-war débâcle involving another series of dust bowls and hungry and disillusioned rural communities. The small volume is especially adapted for rapid reading by every American concerned with the security of his homeland.

A SURVEY OF EROSION, a Handbook. By the Soil Conservation Board of Victoria, Australia. Melbourne, December 1941.

The State of Victoria, Australia, now has a Soil Conservation Act, and a Soil Conservation Board. Thus, right in the middle of war, our friends down at the bottom of the Pacific get started—and keep going—with a program to protect their soils. They intend, and expect, to hold their land for many centuries to come, for the benefit of many future generations of Australians; and, what is more, they intend to put it in condition and keep it that way even while they fight the enemy who would take it from them—if he could.

Victoria is the second Australian State to pass a law and organize for the prevention of soil erosion and promotion of soil and water conservation farming methods—New South Wales was first. This handbook, designed for educational purposes, is based on the more extensive and detailed handbook entitled "Soil Erosion in Victoria" which is being used by land inspectors and other officials now engaged in making a State-wide survey similar to the general reconnaissance erosion survey made by the Soil Conservation Service of the United States in 1934.

The different kinds of erosion—sheet, rill, gully—as well as accumulations of eroded material, are to be recognized and mapped, with variations in the intensity of each. In addition to the mapping of erosion, the surveyors are giving consideration to topography, soil types, and the vegetative cover. Topography is to be mapped as flat, undulating, hilly or very steep. Color and texture will be used in delineating the soil; also such characteristics as saltiness or stoniness will be observed and recorded. Considerable importance is being given to types of farming or land management: that is, dairy farms, sheep and cattle ranches, are separated from the wheat farm and the mixed farming enterprises. The dominant species of grasses or trees will be shown in both the range and forest country.

Characteristically, the Victoria Soil Conservation Board is not deterred by lack of specially trained personnel and funds in wartime: They are conducting this survey by utilizing the services of officials of the State and Forest Departments who have acquired a knowledge of land conditions in the conduct of their regular responsibilities.

Along with this Handbook the Soil Conservation Board of Victoria is distributing a reprinted article on the erosion control methods already in use at Dookie Agricultural College where the "problem . . . is the same as that confronting more than half the State—the safe disposal of storm-water." The work at Dookie consists chiefly of control of runoff in pastures and cultivated fields and treatment of gullies. Judging from this article, which is written by G. B. Woodgate, Principal of the College, the Soil Conservation Board of Victoria already has at hand an excellent demonstration.

EXPERIMENTS WITH BLACK LOCUST

We have an experiment under way at Pennsylvania State College to determine the effects of locust placed about 20 feet apart in a regularly managed pasture. We also have at the Hector Land Use project about 30 acres of pastures planted to black locust in a 20 x 20 foot spacing. In Maryland, we, in cooperation with the Expreiment Station, have a number of plantings on farms of cooperators. The Experiment Station made a plant population count at the beginning of the test and was to make soil analyses at the time of planting, and to follow up changes which might occur later.—From a letter to C. R. Enlow from Grover F. Brown, chief, regional agronomy division, Soil Conservation Service, Upper Darby, Pa.

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Compiled by ETTA G. ROGERS, Publications Unit

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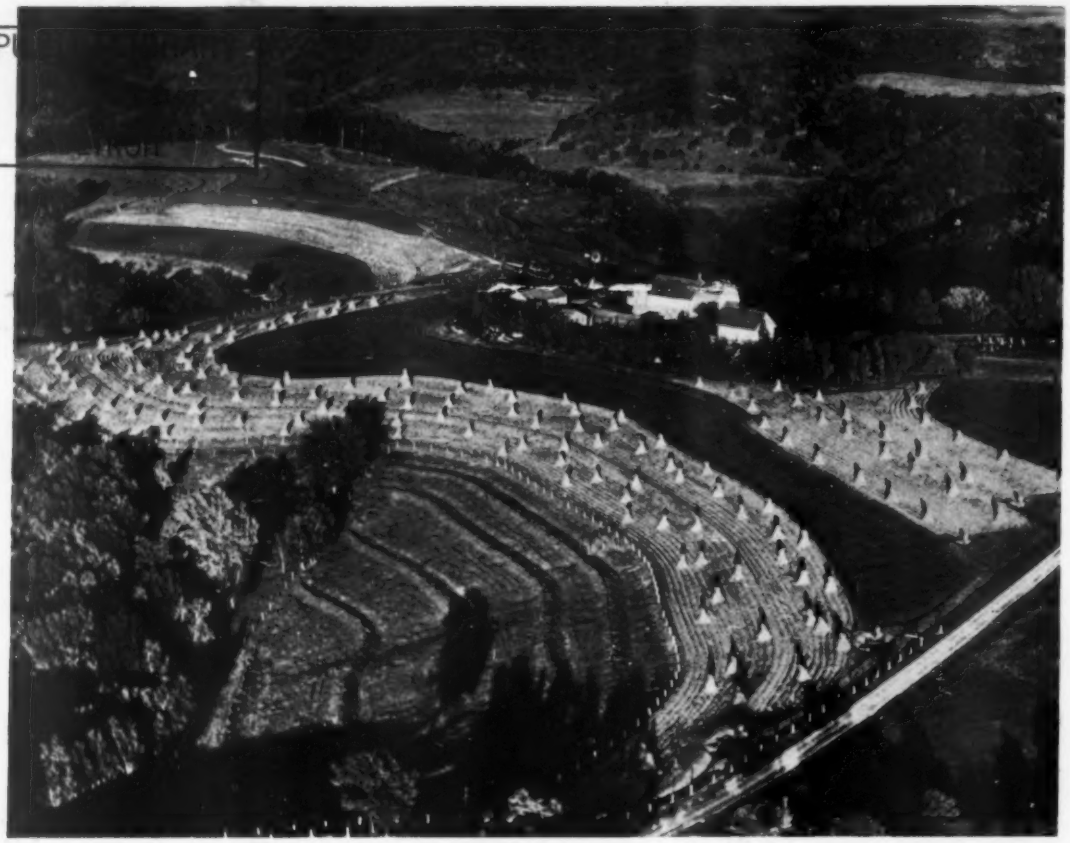

"Design for Living"

AIR VIEW OF THE SOIL CONSERVATION EXPERIMENT STATION, LA CROSSE, WIS. PHOTO BY JAMES N. MEYER.

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